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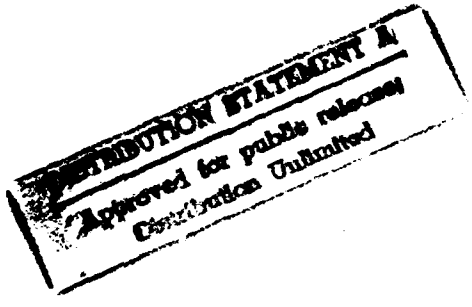
The 1962 Howze Board and Army Combat Developments

J. A. Stockfisch



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United States Army

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Preface

This report reviews Army combat developments with special reference to the 1962 U.S. Army Tactical Mobility Requirements Board (the Howze Board), and the part the Board played in the progression of Army aviation from the 1942 Piper Cub "artillery" aviation to the emergence of the Air Mobile Army Division in 1965. Since Army aviation was a continual source of tension between the Army and Air Force (including the World War II Army Air Forces), attention is given to disagreements about "close air support," how post–World War II resolution of the issue may have adversely affected application of aviation technology to the ground war, and how the issue might have been more quickly and effectively resolved than having to resort to the ad hoc approach that characterized the Howze Board and the Defense Secretary's response to its recommendations.

As a combat development case study, it suggests how the Army's Training and Doctrine Command's (TRADOC's) recently established "Battle Laboratories" might accomplish more decisively what the Howze Board and follow-on activities were called upon to carry out in too little time.

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Summary

In 1992 the Army's Training and Doctrine Command (TRADOC) created a set of new organizations called Battle Laboratories ("Battle Labs") to augment the combat development activity of the Army's specialized branches and services. The development of aviation during the present century profoundly affected military affairs, but only within the last thirty years were Army ground forces directly affected by aviation technology. The shift took place as a result of the ad hoc 1962 U.S. Army Tactical Mobility Requirements Board (the Howze Board), which led to the innovation of "air cavalry" and the integration of the armed helicopter into combined arms warfare. Examination of the Howze Board's approach to combat development has important implications for the Battle Labs.

Reorganization of the Army in 1942 and creation of the quasi-independent Army Air Forces (AAF) led to Army aviation in the form of Piper Cub "artillery" aircraft that were organic to field artillery organizations.[1] Postwar arrival of the helicopter and its use by the Army and Marines in Korea for casualty evacuation and limited use for other purposes provided new technology to expand Army aviation.

In 1954, General James Gavin advanced the idea that aviation technology allowed reinventing the cavalry function and that the Army needed it, especially in the context of a nuclear battlefield. In 1955, the Army's Aviation School moved from Fort Sill to Fort Rucker, Alabama, where the commander named a combat developments officer to undertake a program of testing weapons attached to helicopters, developing flying techniques, and drawing up an organization table for an air cavalry company. Similar activity sprang up elsewhere in the Army.

The new Kennedy Administration, emphasizing conventional forces, increased strategic airlift capability to deploy Army units quickly. Army aircraft, particularly helicopters, seemed necessary to deliver supplies to forward troops from airheads served by heavy Air Force assault transports, especially in poorly developed areas. But the Army aircraft cupboard was bare relative to the likely need. Discussion with Army aviators of this and other aircraft applications

[1] In Army lexicon, the term "organic" refers to equipment, personnel, and suborganizations that are an integral part of a larger organization like a regiment or division. For a more detailed explanation, see Section 4, fn. 7.

produced two April 1962 Memorandums that Secretary McNamara sent to Army Secretary Stahr directing a fresh look at aviation requirements. The resulting Howze Board during the summer of 1962 produced an enormous amount of material, and recommended sweeping changes in the Army's aviation program and force structure based on air assault divisions and air cavalry combat brigades equipped with armed helicopters, fixed-wing fire support, and other aircraft. The Air Force reacted to these proposals by creating its own board to criticize and refute the Howze Board's recommendations.

After evaluating these conflicting ideas, the Army was allowed to create in February 1963 the 11th Air Assault (Test) Division and an air transport brigade for further review. Also, the newly created STRIKE Command was directed to carry out joint Army–Air Force exercises with Tactical Air Command resources, but no armed helicopters.

By early 1965, testing the air assault division neared its end. Any final evaluation and Pentagon decision about the Gavin-Howze air cavalry concept, however, would have been difficult and controversial because most of the testing was extremely ad hoc. The same held true for the 11th Air Assault Division. Tests of hypotheses implicit in controversial air-ground doctrine, weapon effects, tactics, and the like by instrumented and structured field trials, with a long-term program of sequential operational testing of air-ground interactions, including forward-area air defense, could have been initiated in the middle 1950s. But the period between 1962 and 1965 was too short for anything but the nonscientific testing that took place. As it turned out, any ambiguity was resolved by the buildup of American ground troops in Vietnam and the successful employment there of the Air Assault (Test) Division, which was renamed the 1st Cavalry (Airmobile) Division. Even so, the Howze Board's ad hoc approach to testing, although it was better than no testing at all, was not the best way to carry out combat development. The Army should do better in the future. More time should have been allocated to carry out a sequential testing program.

Army combat development must be improved by closer connection and interaction between its model building and testing activities. Now, models and their simulations are uncritically used with little attention given to whether the model is empirically validated. This will be troublesome for the Battle Labs if they use simulations alone to carry out their work. The results of simulations can always be contested if the models on which they are based are neither transparent nor empirically validated. Another problem is that many data or numerical inputs used in models may be of questionable quality, often because they are the output of some other nonvalidated model. These conditions suggest that somewhere in the Army's system there should be a mechanism to lay out

programs of models and assertions about tactics and operational performance that can be empirically validated and field tested. It may be necessary for the Battle Labs to take on this function and actively design and carry out field experiments if they are to achieve their objective.

Acknowledgments

Dr. John Lockerd and Dr. William Pettijohn, both of whom participated on the Howze Board, kindly reviewed an earlier version of this report. RAND colleagues John Craigie and Lewis Jamison provided technical reviews.

Acronyms

AAF	Army Air Forces
ALOC	Air Line of Communication
AGF	Army Ground Forces
CDC	Combat Developments Command
CDEC	Combat Developments Experiment Center
CORG	Combat Operations Research Group
CONARC	Continental Army Command
OSD	Office of the Secretary of Defense
ORO	Operations Research Office
RAF	Royal Air Force
ROAD	Reorganization Objectives Army Division
TAC	Tactical Air Command
TO&E	Table of Organization & Equipment
TRADOC	Training and Doctrine Command

1. Introduction

In April 1962, the Army created an ad hoc Army Tactical Mobility Requirements Board (the Howze Board) in response to Secretary of Defense Robert McNamara's directives to take a new and comprehensive look at Army aviation requirements. In less than four months, the Board delivered a *Final Report* that recommended innovative airmobile units up to the division level in which organic[1] helicopters and fixed-wing aircraft would replace many surface vehicles. The Board also recommended a radical change in the Army's structure to convert five of it sixteen active divisions to the airmobile configuration. The Board and its follow-on activities are themselves important parts of this story. This report describes the Board's role in a combat development[2] that created the airmobile Army division and expanded the application of Army aviation technology in ground warfare. This unique combat development and management innovation provides a useful lesson for the future.

The Army Training and Doctrine Command (TRADOC) recently created a set of six Battle Laboratories ("Battle Labs") to implement a new approach to combat developments.[3] Traditionally, the Army's combat branches and technical

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[1]The term "organic" when used in the context of Army organization describes whether the unit "owns" and has administrative control of the specialized equipment or resources in question. The term is to be contrasted with "attached," whereby the resource is assigned when needed from a larger and separate pool of the specialized capability. These are not necessarily mutually exclusive concepts, however. For example, each Army division has an organic medical battalion. But most Army medical units are "independent" and assigned where needed. See also Section 4, fn. 7.

[2]"Combat development(s)" is a distinctive Army term resulting from Project Vista, which was undertaken in early 1951 by the California Institute of Technology (sponsored by the three Services) to advise how technology might be managed and applied to ground and tactical warfare, with special reference to Europe. Although its April 1952 report was not officially approved, it led the Army Chief of Staff to establish a Combat Developments Group and recommended a Combat Developments Experiment Center (CDEC) that was created in 1956 to prove, disprove, or modify "theories" (or "models"). For an account of Vista, see Lt. General James M. Gavin, *War and Peace in the Space Age*, Harpers, New York, 1958, pp. 129–135.

The combat developments function was assigned to the Army Field Forces, which became the Continental Army Command (CONARC) in 1955; in both cases it was implemented by the Army's school system and service centers. In 1962, a Combat Developments Command (CDC) was established as "coequal" to CONARC, but in 1973 CDC was dismantled and the combat developments function was assigned to the new Training and Doctrine Command, which returned it to the branch and service schools. Hence the term "combat development(s)" has organizational as well as activity meanings in Army lexicon. If we use the term "combat development" as a military equivalent to a civilian-sector "innovation," it includes any *successful* new weapon design, organizational change, or revised tactics. Usually, a new weapon requires organizational and tactical changes as well, although an "innovation" need not necessarily involve new technology. Innovation can use an existing technology in a new way by revising tactics and organization, as was the case with the Howze Board and the creation of the airmobile division.

[3]The change was announced by General Franks, Commander of TRADOC, and General Shoffner, Commander of the Combined Arms Command, and appeared in letters during the summer

services have been proponents of new weapons, tactical doctrine, and organizational structure applicable to their specialty. As "users," they also specify the physical characteristics by which improved technology is applied to new weapons and equipment, and are therefore "proponents."[4] This function was coupled with "acceptability" testing carried out by a test board located at a service center. For major issues, like the structure of the division, an ad hoc board of senior officers would be established.[5] During World War II, Lt. General Lesley McNair, Commander of the Army Ground Forces (AGF), personally shaped the Army's wartime structure.[6] The Howze Board combined these approaches with its focus on aviation, organization and force structure, a testing program, and the strong leadership of its president. Because the Board addressed the broad concept of tactical *mobility*, its proposals affected all Army communities. In this respect, the proposed Battle Labs have something in common with the Howze Board—the focus of a single laboratory cuts across two or more branches and services.

Like all stories, that of the Howze Board has a beginning, middle, and end. The beginning was the evolution of *organic* Army aviation from World War II to the Board's creation in response to Secretary McNamara's direction; the middle was the Board's activity and its recommendations; the end was the actions and air mobility combat developments the Board set in motion. The next three sections treat these phases. The final section evaluates the Board as an approach to combat developments and the lessons it may offer for future Army combat developments and the Battle Labs.

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of 1992. For a published description of the change, see "Battle Labs: A New Dynamic," *Army Logistician*, March–April, 1993, pp. 14–16.

[4]Although the military "user" has been the proponent of a new system, "developers" have informally frequently proposed them. For example, before World War II the Ordnance Department consistently advocated heavier tanks than either the infantry or cavalry branches were willing to accept. The technical services themselves were both proponents and developers of their unique equipment. Perhaps the most successful Army pre-World War II combat developments were carried out by the Quartermaster Corps, which as proponent and developer of noncombat vehicles provided the jeep and 6x6 2 1/2-ton truck, which were classics.

[5]There are also instances of creating special boards composed of lower-ranking persons to address special problems that cut across two or more technical or operational fields. An example was a group of ordnance and medical specialists during the 1920s that carried out experiments to determine the terminal ballistics effects of bullet mass-velocity combinations by firing at live pigs. Predictably, it was dubbed the "Pig Board." Unfortunately, its recommendation to adopt a smaller-caliber rifle was turned down by Chief of Staff Douglas MacArthur.

[6]Kent Roberts Greenfield et al., *United States Army in World War II: The Army Ground Forces: The Organization of Ground Combat Troops*, Washington, D.C., 1947, pp. 265–382.

2. The Beginning

World War II and Army Organic Aviation

Army aviation began in World War II when the Army Air Forces (AAF) freed themselves from the concept of "air support" and subordination of an aviation commander to a ground commander, and replaced it with the concept of "tactical air" and the Royal Air Force (RAF) doctrine that ground and air force commanders were co-equals.[1] Although the AAF[2] sought to control all aircraft, it was recognized that the Army required light organic aircraft for adjusting artillery fire and target spotting. Piper Cubs—two-passenger 65-horsepower civilian airplanes designated the L-4 ("L" for liaison) that were adopted during the 1941 Louisiana maneuvers—were assigned to each division and field artillery brigade.[3] The AAF retained responsibility for artillery fire adjustment from high-performance aircraft, liaison aircraft to provide other service to ground units, and technical service responsibility to procure the Army's aircraft and spares and provide depot and field maintenance.[4]

As the war continued, the increasingly popular field artillery aircraft were borrowed whenever possible to provide additional services such as casualty evacuation, emergency resupply, photo reconnaissance, wire-laying, and road traffic control. Air Force liaison squadrons were equipped with the larger 165-horsepower Stinson-Vultee L-5, and from the latter half of 1943 on the AGF in Washington had to struggle with the AAF and the War Department Staff G-3 and

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[1]This arrangement emerged in North Africa in early 1943 when all Allied air forces were placed under the command of Air Chief Marshal Sir Arthur Tedder, who conceived the distinction between "tactical"and "strategic"air forces as theater sub-organizations and purged the term "army co-operation." RAF doctrine strongly asserted the twin concepts of co-equal ground and air force commanders and, especially, "centralized control"of air resources, which was quickly accepted by American airmen under the new arrangement. Shortly thereafter, in Washington a new War Department FM 100-20 was published without concurrence of Army Ground Forces (AGF). The Field Manual asserted the RAF doctrine in bold type and forbade the theater commander to attach AAF units to ground force commanders. (Alfred Goldberg and Lt. Col. Donald Smith, *Army-Air Force Relations: The Close Air Support Issue*, RAND, R-906-PR, October 1971, pp. 2–3.)

[2]The AAF was created on June 20, 1941, the first step toward autonomy. The second and major step, however, was General Marshall's masterpiece 1942 War Department reorganization that created the AGF and the Services of Supply (later the Army Service Forces) with the three branches co-equal and the General Staff greatly reduced in power.

[3]Kent Roberts Greenfield, *Army Ground Forces and the Air-Ground Battle Team Including Organic Light Aviation*, Study #35, Historical Section, Army Ground Forces, 1948, p. 62.

[4]Goldberg and Smith, *Army-Air Force Relations*, pp. 4–5.

its large number of Air Corps officers over the expanded use of Army aircraft and their assignment to nondivisional organizations such as tank-destroyer, engineer, and signal units. In January 1944, AAF Commander General H. H. Arnold in a personally signed memorandum to the Chief of Staff made an all-out attack against artillery aviation and proposed AAF control of all liaison aircraft. The issue was resolved by allowing the ground forces to retain the artillery support role but with a G-3 admonishment to restrain from using the aircraft for other purposes like photographic reconnaissance, while holding the AAF responsible for general liaison and courier service, for which a squadron of 32 aircraft was to be assigned to each field army.[5]

Overseas, local tactical air forces and armies continued developing workable air-ground procedures, including communications and the use of forward air controllers that could communicate with support aircraft. For example, in Italy after the Salerno landing, the Fifth Army and the XII Air Support Command[6] worked out an arrangement whereby the two commands placed their forward command posts within a short distance of each other, the Army assuming evaluation, screening, and coordination of its units' requests for support, and informing them which requests would be executed. The Air Support Command concentrated on executing the missions, and as of November 1943 no request was refused on the ground that the target was not worth the effort—a sharp change from the situation that had existed in North Africa and Sicily. Forward air controllers (eventually an air officer in a liaison aircraft) who could speak to and lead fighter-bomber pilots to targets in the path of advancing troops implemented the relationship. Ground officers were occasionally allowed to talk to pilots and participate in briefing them, although the idea of Army forward artillery observers directing air strikes was resisted, probably because it might set the dangerous precedent of a ground officer "controlling" Air Force aircraft.

Ad hoc arrangements with respect to reconnaissance and intelligence-gathering needed by the Army, subjects the AAF had neglected in the United States, were developed in Italy and other overseas theaters, especially in France after the Normandy landings. Under General Quasada's command, Ninth Air Force fighter-bombers were allocated to three Tactical Air Commands, with one each attached to the First, Third, and Ninth Armies but with the size of each varied

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[5]Greenfield, *Army Ground Forces and the Air-Ground Battle Team Including Organic Light Aviation*, pp. 65–66.

[6]This was a component of the Twelfth Tactical Air Force, which also contained bomber, fighter, and troop carrier commands, in whose organizational context the term "air support"did not have the connotation of being subordinated to ground commanders. As of 29 January 1944, XII Air Support Command possessed seven fighter and fighter-bomber groups and one light bomber (A-20) group. Other Twelfth Air Force commands were also employed on occasion for army support.

according to need by shifting air groups[7] between Armies. In the South and Southwest Pacific, a high degree of cooperation between ground, air, and naval forces emerged, none of which was explicitly sanctioned in Washington. In those theaters, the campaign strategy was to capture islands or coastal lodgments to acquire airfields so land-based aircraft could support an amphibious landing.[8] Friendly shipping necessary for army and air force supply required naval escort and air cover from friendly land-based aircraft. The obvious need for land-based aircraft to support ground and naval operations to the fullest possible extent could not be ignored.

Meanwhile, the role and activity of Army aviation expanded, as did refinement of artillery spotting. Although artillery aircraft were not supposed to fly over enemy lines, they frequently did at tree-top level, becoming adept at dodging enemy fighters and ground fire to the extent that aviator casualties were no greater than those of ground forward artillery observers. Light aircraft relayed radio communication between the ground and supporting fighters and bombers. By 1945, L-4 Cubs were being fitted with an improvised infantry shoulder-fired rocket-launcher (the so-called Bazooka), resulting from a combat development by an unknown pilot. By the middle of 1944, it was evident that an aircraft better than the Cub was desirable, which the AAF pointed out and which Army aviators soft-peddled to avoid controversy. This condition nevertheless raised again the question of whether the 32-aircraft AAF liaison squadrons should take over more of the organic aviation work. Although there was some Army feeling that the AAF L-5s might be too large for most of its needs,[9] the facts that AAF liaison squadrons would be located on distant fields and that the pilots were enlisted men trained only to fly were reasons not to accept the idea, and it was explicitly argued that ground liaison pilots be trained in the branch arm in which they served.[10]

By the end of the war, the AAF and the War Department guardedly accepted organic Army aviation, by which time its aircraft inventory had expanded to about 1600. But the war's end left unresolved the same issues about air-ground relations that existed before and during the war, issues that were heightened with the National Security Act of July 26, 1947 that created the Department of the

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[7]During World War II, an AAF group was comparable to a present Air Force wing, except the group's commanding officer required a rank of colonel.

[8]Greenfield, *Army Ground Forces and the Air-Ground Battle Team Including Organic Light Aviation*, pp. 77-96.

[9]However, some Army pilots in Italy would have preferred the more powerful L-5 because they often operated in mountain terrain.

[10]Greenfield, *Army Ground Forces and the Air-Ground Battle Team Including Organic Light Aviation*, p. 110.

Air Force. On the one hand, Air Force proponents strongly asserted that the war validated the RAF doctrine that air and ground forces were co-equal and, especially, that aircraft should be centrally managed by Air Force officers. A further idea strongly asserted in AAF and RAF doctrine was that descending priority be attached to the missions of (1) gaining "air superiority" by air combat and attacking enemy airfields, (2) deep interdiction to deny supplies to enemy forces over an entire theater during a long period of time, and, finally, (3) combined actions with ground forces, which would include close air support.

Soldiers, on the other hand, would rank (1) direct fire support immediately in front of friendly troops, (2) air defense of friendly forces, (3) attack of enemy rear area targets, (4) support of airborne forces and cargo resupply, and (5) reconnaissance and observation. A compelling riposte to not assigning top priority to "air superiority" is that both friendly and enemy air forces attempting to carry out the favored army missions provide ample occasion for air battles in which the air force with the best (and most) air superiority fighters and fighter pilots will prevail. Thus, the RAF in Libya and Egypt found that major ground operations provided the best and most frequent opportunity to encounter the enemy air force in air battles, and the strict doctrine preached by the Air Staff was for all practical purposes ignored, since enemy airfields and deep interdiction targets could be attacked during the frequent and often long lulls in the ground fighting.

The war's end left many soldiers with negative feelings about aviation and the AAF. The fact that only some 10 to 15 percent of fighter-bomber sorties in Europe were allocated to close army support, the bombing of friendly troops at Cassino and St. Lo, France, and troop-carrier dropping errors that widely scattered paratroopers in the Sicily and Normandy landings were contributing factors. That AAF continued wartime neglect of air-ground training in the United States dismayed many senior AGF officers responsible for training, and frequent questions about organic aviation raised by both the AAF and its officers assigned to the G-3 War Department Staff generated enduring resentment on the part of field artillery aviators who, in turn, often stretched the letter of regulations governing organic aviation use.

Between 1945 and 1947, the AAF vigorously lobbied for independence, and its emphasis on strategic bombardment and the atomic bomb may have caused it to neglect Army support.[11] Nevertheless, the momentous National Security Act of 1947 that created the Secretary of Defense, the Departments of the Army, Navy,

[11] Bergerson, *The Army Gets an Air Force*, p. 100.

and Air Force, and other agencies explicitly stated that "The Army . . . includes land combat and such aviation . . . as may be organic therein."[12] Army aviation now had congressional sanction, and the second phase of its evolution began.

The Helicopter, Korea, and Tactical Mobility

Development of the helicopter and the Korean War gave impetus to Army aviation, which was nevertheless contested by the Air Force and caught up in the "roles and missions" controversy that policymakers tried to resolve by criteria that seemed to make no particular sense, like limiting the weight of Army aircraft or the distance beyond the fighting front that Army aircraft could penetrate.[13] In the Korean War, both the Army and the Marine Corps used helicopters for medical evacuation, and the Marines also used them extensively for command and control, emergency resupply, and for some emergency troop lift. The Marine Corps immediately after World War II war researched the combat utility of ship-to-shore movement of amphibious assault troops by helicopters to supplement or even replace landing craft.[14] With the precedent of attaching armament to some of its fixed-wing World War II artillery aircraft, it was no surprise that isolated Army experiments to arm helicopters were seen in such places as Japan and the Aberdeen Proving Ground.[15] In 1955, war games with helicopters in tactical troop movements stimulated interest in arming them for fire suppression when transporting soldiers in air assaults.[16]

Army aviation was given a sharp focus by Major General James Gavin in an article appearing in the April 1954 *Harpers*, "Cavalry, and I Don't Mean Horses."[17] Drawing on his experience as a World War II airborne commander (Sicily, Salerno, Normandy, and Holland [Operation Market Garden]) and citing General Walker's near-disastrous 1950 retreat down the Korean Peninsula to the Pusan perimeter, Gavin emphasized that the ability to perform the traditional cavalry functions of reconnaissance, screening, and blocking had vanished in modern armies due to reliance on road-bound motor vehicles, which in rough

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[12] *U.S. Statutes at Large*, Vol. 64, p. 321; quoted in Bergerson, *The Army Gets an Air Force*, p. 163, fn. 35.

[13] For a description of these restrictions, see Goldberg and Smith, *Army-Air Force Relations*, pp. 7–12.

[14] See Lynn Montross, *Cavalry of the Sky: The Story of U.S. Marine Combat Helicopters*, New York, 1954, pp. 48–66, which also suggests that the Navy Department was the principal supporter of helicopter R&D during the immediate postwar years.

[15] The Marines were apparently the first to experiment with armaments attached to helicopters during 1950 (Montross, pp. 104-105).

[16] Bergerson, *The Army Gets an Air Force*, p. 72.

[17] *Harpers*, April 1954, pp. 54–60.

country could be easily ambushed or taken in the flank by light infantry, as the North Koreans did to General Walker's forces and as the Chinese did to General MacArthur when his forces approached the Manchurian border during the following winter.[18] When "cavalry" is defined as highly mobile ground forces relative to less mobile but more heavily armed (and armored) ones, a hasty enemy retreat can be converted into a disorganized rout. After the September 15, 1950 American Inchon landings, the North Koreans were obliged to make a hasty retreat, but the United Nations forces possessed no "cavalry." The World War II marriage of the infantryman, parachute, and air transport was a combat development designed to perform such cavalry functions as blocking or quickly seizing dominant terrain or crossroads,[19] although airborne operations were costly and risky because of possible dropping errors and no heavy weapons capable of defeating enemy tanks.

Gavin concluded his article with discussion of a future atomic battlefield. The only countermeasures were drastic reduction in battle-area troop density, more automatic weapons and quick and efficient ammunition resupply, and a quick way to concentrate widely dispersed troops at the opportune time. The necessary cavalry functions on a nuclear battlefield would have to be performed at correspondingly greater distances and much more rapidly than had been traditionally acceptable. In conclusion, he noted the mobility differential to make all this possible "is within our grasp, fortunately, in the air vehicles now being developed—assault transports, light utility planes, helicopters."[20]

The expanded Army aviation resulting from the Korean War, the usefulness of helicopters the war made evident, and Gavin's compelling argument about aviation and relative ground mobility, particularly in the tactical nuclear weapons context, generated increased interest in and support of Army aviation. In 1954, the Army's Aviation School moved from Fort Sill to Fort Rucker, Alabama. An Aviation Test Board was created at Fort Rucker to adhere to the practice of co-locating materiel test boards for weapons and systems of a specialized branch or service with the corresponding School.[21] The Army aviation testing that had been performed by the Field Artillery Board at Fort Sill was transferred to Fort Rucker, where an Aviation Combat Developments

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[18]For an account of how Chinese light infantry frustrated U.S. capital-intensive forces in Korea, see Major Scott R. McMichael, *A Historical Perspective on Light Infantry*, Combat Research Studies Institute, U.S. Army Command and General Staff College, Fort Leavenworth, Kansas, 1987, pp. 51–78.

[19]Gavin, 1954, p. 55.

[20]Gavin, 1954, p. 60.

[21]Williams interview, p. 26, the Army's Senior Officers Oral History Program (see full citation in the bibliography).

Agency was also established.[22] Thus Army aviation acquired the organizational structure of both a combat branch and a technical service (as were the Engineer and Signal Corps), although commissioned-officer aviators continued to belong to the older branches and services, which was wise because it blunted any accusation of creating an additional "Air Force" while allowing aviators to initiate aviation combat developments in the established branches and services. In early 1956, Lieutenant General Gavin, the Army's G-3, selected Major General Hamilton H. Howze, an armored officer with a brilliant World War II record, to be Chief of the G-3 Aviation Section,[23] although the title "Chief" was a misnomer since it was a staff position.[24]

In June 1956, Brigadier General Carl I. Hutton, Commander of the Aviation School, initiated a program that led, first, to a series of experiments testing weapons attached to helicopters, and, second, to tactical concepts and flying techniques intended to implement a "Sky Cavalry" concept. Colonel Jay T. Vanderpool, a nonflying combat developments officer assigned to Fort Rucker, organized these experiments that were implemented and carried out during off-duty hours and weekends. The objective was to make a "fighting helicopter" because there was little hope the Army could get an armed fixed-wing aircraft "through the Pentagon."[25] For this purpose, a Bell H-13 helicopter, the smallest aircraft available,[26] was mounted with two 0.50-inch World War II aircraft machine guns and launching rails for 80mm, fixed-fin, Oerliken rockets designed for fixed-wing aircraft. Gun sights, intervolometers, and other firing devices were borrowed from the Navy. After two weeks effort in the post machine shop, the team of three officers and two enlisted men had the ad hoc weapon system ready to test. With worries about whether the aircraft's structure could absorb gun recoil and whether a slow or zero aircraft speed allowed effective rocket launching from a very short travel rail, firings were made from a 4- or 5-foot

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[22]During much of the post-World War II period, combat branch test boards carried out "acceptability" testing of new or proposed weapons that emphasized technical performance characteristics but that were also called "user requirements." In 1962, the newly created Army Materiel Command acquired the test boards, which remained at the respective service centers. Combat Developments Agencies, on the other hand, were responsible for doctrine relevant to the combat or service specialty, specifying the performance and physical characteristics of new systems, and the organization and structure of unit tables of organization and equipment (TO&Es). Agencies were part of the Army "school system" except during 1962–1974, when they were part of the Combat Developments Command. The Combat Developments Command was created because the "school system" was often "too conservative" to be an effective creator of new doctrine; however, keeping the agencies, which were usually headed by a colonel, at the service centers, which were usually headed by a major general, may have been at odds with the idea of an "independent" Combat Developments Command.

[23]Interview, Gen. Hamiliton H. Howze, p. 1.

[24]Hamilton H. Howze, "The Howze Board," I, *Army*, February 1974, p. 9.

[25]Vanderpool interview, p. 155.

[26]See Table 1 in Section 3 for the characteristics of this and other Army aircraft.

wooden platform, with none of the worrisome possibilities taking place. The test was repeated with the rotor running at idle to create down-wash to see if there was an adverse effect on the rocket launch. Next, firing tests commenced in a hovering mode and then at varying increasing speeds. Thorough pre- and post-flight inspections, assisted by Bell Helicopter engineers, revealed no material damage, setting the stage for the test sequence that immediately followed.[27]

The Aviation School commander next directed Vanderpool to "come up with a company size air-cavalry organization, determine the aircraft requirements, the pilot requirements, draw up an organizational sketch, and draw up a maneuver plan. . . ."[28] The model used to carry out this assignment was Wellington's early 19th century cavalry of light horsemen that carried out reconnaissance, dragoons who used horses as personnel carriers but dismounted to fight on foot, and horse artillery for fire support. Volunteers who provided the "troops" included civilian training pilots, some of whom were ex-Air Force and Navy fliers who more quickly grasped what the experiment was about than did some of the Army pilots. The group promptly began implementing cavalry tactics, and over the following weeks tested on helicopter models various weapons that ordnance arsenals could scrounge. Each pilot and his enlisted assistant was responsible for arming his own machine.[29] The ad hoc organization provided demonstrations during 1957 to visitors from various headquarters and at Army schools. In writing a manual for the new air cavalry concept, an old 1936 cavalry manual provided Vanderpool both a model and language that many senior officers well understood.[30]

Another of Vanderpool's combat development contributions was the "nap-of-the-earth" helicopter flying technique. In planning an air cavalry demonstration at Fort Bliss, Texas, he drew upon knowledge from having been raised in desert country that desert terrain is not perfectly flat but contains swales or wet-weather stream depressions easily recognizable from vegetation. By utilizing these features in a gunship tactical exercise, it was demonstrated to visiting high-ranking officers, including Army Chief of Staff Gen. Maxwell Taylor, that helicopters were not easily detectable on seemingly "flat" terrain.[31] The effect of the demonstration was such that, according to Vanderpool, "Now we had the

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[27]Vanderpool interview, pp. 158–160.

[28]Vanderpool interview, p. 161.

[29]Vanderpool interview, pp. 163–164.

[30]Vanderpool interview, pp. 166–167.

[31]Vanderpool interview, pp. 172–174.

Chief of Staff of the Army behind us. From then on we were on the higher political pastures."[32]

Another aviation combat development that illustrated the Army's decentralized approach took place at the Fort Benning Infantry Center when the commander designated an officer to undertake experiments in arming helicopters. Equipment was scrounged from a number of nearby military bases, including Fort Rucker, and experiments were performed for representatives of helicopter companies. These companies, in turn, undertook such armament developments as the Bell Helicopter Company's installation of the French-designed SS-10 wire-guided anti-tank missile on the OH-13.[33]

This surge of aviation combat developments beginning in 1956 coincided with a major combat development: the Pentomic division.[34] Its novel feature was its infantry structure composed of five "battle groups,"[35] each with five rifle companies, a headquarters company, and a combat support company. It was a radical shift from the triangular three-regiment structure that prevailed in most European armies by the end of World War I and was adopted by the U.S. Army in the late 1930s. It was based on the idea that although the triangular structure was good for offensive operations, it was not as flexible for defense as four or five units. It was also felt that the regiment was too large a unit to risk being destroyed in a nuclear context, and that the future battlefield would be broader and deeper, necessitating greater tactical unit dispersion. Armored divisions, on the other hand, would retain their World War II structure of three combat commands, which were small tactical headquarters to which battalions were allocated according to assigned missions—a mix of infantry and tank battalions, a cavalry squadron, and an aviation company. The infantry division's artillery possessed missile and artillery units capable of conventional or atomic fires.

Field tests of the first restructured divisions and further analysis of the "atomic battlefield" concept and its necessary troop dispersion indicated flaws in the Pentomic concept. Among them were an overemphasis on nuclear firepower, inadequate mobility and communications relative to intended tactical dispersion in a nuclear setting, and the larger required span of control because of five battle groups. It was also felt that the battle group's strength, which was less than the

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[32]Vanderpool interview, p. 174.

[33]Bergerson, 1980, pp. 75–77.

[34]Virgil Ney, *Evolution of the U.S. Army Division, 1939–1968*, Combat Operations Research Group, CORG-M-365, United States Army Combat Developments Command, Fort Belvoir, Virginia, 1969, pp. 71–75.

[35]The term "battle group" was taken from the World War II German *Kampfgruppe*, which was usually improvised in the field and identified by the name of its commander.

previous regiment but more than a battalion, was ill-suited for conventional operations. Thus much of the Army heaved a sigh of relief with the 1961 arrival of the Kennedy Administration, which emphasized conventional war capability and provided a rationale to return to the triangular division.[36] The ROAD division (Reorganization Objectives Army Division, 1965) was adopted in 1961, but with the three armored division "commands" renamed "brigades," restoration of infantry battalions, and elimination of the regiment as an administrative and tactical unit.[37] Although the triangular organization had demonstrated capability for conventional war, the new organization was much heavier than the Pentomic division and was to have nuclear (dual) capability as well. General Gavin's "relative mobility" problem not only remained but was exacerbated by other aspects of the new Administration's foreign and defense policies.

The Howze Board and Building Up Conventional Forces

The new Administration's defense policy deemphasized "massive retaliation" with its low threshold to nuclear weapons use. It also expected more Soviet aggression by means of proxies in places like Korea, Southeast Asia, and the Middle East, and more Soviet-supported insurgency in Third World countries. These expectations called for building up conventional forces, improving their effectiveness, and shaping their structure coherently, which further required improved strategic mobility to quickly deploy forces located in the United States to trouble spots.

Actions taken in early 1961 to increase strategic airlift capability included initiating development of the C-141 cargo transport and ordering additional C-130 assault transports and a small number of C-135 cargo versions of the Boeing KC-135 tanker. However, the large and growing number of Lockheed C-130 assault transports[38] raised the question: How might they be best used *after*

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[36]House, 1984, p. 21.

[37]In making the transition to the ROAD concept, the Army had developed the "Modern Mobile Army, 1965-1970 (MOMAR)," which would have only two division organizations—heavy and medium—and would have retained the Pentomic division structure by means of five combat commands tailored according to tactical need or situation and with a heavy emphasis on mechanization and aviation. The MOMAR field army would directly control the division and thereby eliminate the corps (House, 1984, pp. 19–20).

[38]The word "assault" with respect to military air transports describes a design emphasis on ability to support an Army airborne operation of dropping paratroops and their equipment, emergency resupply of ground troops by parachute and other cargo extraction methods then under development, and ability to operate in and out of hastily prepared airstrips where landing with a load and taking off empty allows getting by with a shorter runway than is normally required. The C-130 could handle a respectable load over a strategically relevant distance, and for this reason additional ones were ordered in 1961 as an interim quick fix that would serve until C-141s came into the force during the latter half of the 1960s.

the early peak strategic lift requirement is met? World War II experience suggested new possibilities. It did not take much thought to imagine what might have been the outcome if C-130s had been available to supply Patton's Third Army in the summer of 1944. Combat cargo and troop carrier units in India and Burma supplied an entire corps of General Slim's army for the extended period when the Japanese laid seige to Imphal, and also supported three long-range penetration groups of Empire and American troops that operated deep in Burma behind Japanese lines. This experience suggested that assault air transports could best be used, after the peak load strategic airlift is met, to implement an *air line of communication* (ALOC) to supply ground forces in undeveloped areas. The benefits seemed to be twofold. First, ALOCs would reduce or even eliminate the need to build, maintain, and secure roads, pipelines, and warehouses in rough country. Second, they would lower the amount of ground equipment that would have to be rapidly deployed in the first place. To implement an ALOC, however, would require rapid construction of airstrips, improved capability of transport and assault aircraft to operate from rough runways, and quick and innovative ways to unload and handle cargo, like extracting cargo from an aircraft while flying close to the ground or during a touch-and-go landing.

A question remained—how might "retail delivery" from advanced airheads to tactical units be accomplished? Partial but unsatisfactory answers to this question had already come from the Army's aviation program. Earlier, the Office of the Secretary of Defense (OSD) requested the services to justify their requirements for weapons and equipment through arguments based on analysis. The Army Staff's treatment of its aviation needs was unsatisfactory insofar as it strongly asserted the benefits of organic aviation, but the numbers of aircraft requested seemed unduly modest.[39] The OSD analyst reviewing the Staff paper evaluated it and initiated a draft memorandum for Secretary McNamara's signature to transmit the critique to the Secretary of the Army. The result was McNamara's two April 19, 1962, Memorandums: one directed the Secretary of the Army to undertake a thorough review of Army aviation requirements, and the other suggested creating a committee that would include, by name, officers

[39]In his oral history interview, Lt. Gen. Robert R. Williams, a key proponent of Army aviation, stated with respect to the Army paper: "I will have to agree with the operational analysis [Systems Analysis] people that it was pretty sad. It just didn't face up to the problem. It just wasn't well done." Williams interview, pp. 53–54.

and civilians known to be aviation advocates to direct the review.[40] The Army promptly responded by creating the Army Tactical Mobility Requirements Board.

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[40]The memorandums are reproduced in the Appendix. They are also reproduced in Enthoven and Smith, *How Much Is Enough*, pp. 101-104, to support their point that one of the contributions of the Systems Analysis office was to bring new ideas advanced by younger officers to the attention of the Secretary of Defense.

3. The Board's Structure and Activity

The Board's Structure

The Board was created by a letter from the United States Continental Army Command, dated 3 May 1962. Its eventual official membership consisted of 199 officers, 41 enlisted men, and 53 civilians, which excludes many assigned to troop tests, operational analysis, and war gaming. The governing board consisted of its president, Lt. Gen. Hamilton H. Howze, then Commanding General, XVIII Airborne Corps and Fort Bragg, North Carolina; a review committee of 17 officers and five civilians; a two-person advisory panel; and a secretariat. A steering committee, chaired by the president, consisted of the review committee and members of the secretariat.[1] All but one of the men mentioned in McNamara's Memorandum to Army Secretary Stahr were either members of the review committee or secretariat.[2] The Commanding General of the Infantry Center, the Assistant Commandant of the Armor Center, the Special Assistant to the Chief of Staff for Special Warfare, and Brig. General Edward L. Rowney of the 82nd Airborne Division were also members of the review committee. Advisory panel members attended review committee meetings only at the president's invitation. Colonel John Norton, from CONARC, headed the secretariat and was executive to the president. A newly completed primary school building on the Fort Bragg reservation was the Board's headquarters.

Most of the Board's work was carried out by seven working committees[3] between 5 May and 21 June 1962, and eight working groups[4] between 22 June and the end of July.[5] All but one were headed by general officers, many of whom

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[1]In some publications these are listed as the "Howze Board"; however, Annex A, Board Membership, lists the working groups and their members, more properly and adequately capturing the Board's character.

[2]Colonel Robert R. Williams, mentioned in McNamara's Memorandum to Mr. Stahr, had been promoted to Brig. General by the time the Board was established.

[3]The seven committees were titled: Reconnaissance, Security, and Target Acquisition; Tactical Mobility; Fire Power; Logistics Operations and Logistics Support; Operations Research; Field Tests; and Programs, Policy and Budget. See Annex A, p. 17.

[4]The eight working groups were titled: Counterinsurgency; Combat Force; Logistics Forces; Long Range; Strategic Area; Operations Research; Field Tests; and Programs, Policy, and Budget. See Annex A, p. 32.

[5]See Annex A, Board Membership, p. 1.

were also review committee members.[6] Most of their work took place where the group's head was assigned—field testing at Fort Bragg where Brigadier General Rowney was assigned, fire power at Fort Sill, and so on. These groups, consisting of military officers and civilian professionals, had as few as five (Operations Research) to as many as 69 (Field Test Group) members, and were drawn from the Army's technical establishments, schools, and contract research organizations. Their work, most of which is reported in fifteen annexes and their appendixes, produced most of the findings supporting the recommendations presented in the Board's *Final Report* and General Howze's "Brief," as well as other information.

Most of the Board's resource-using activity was that of its Field Test Group, which had the full-time use of one battle group and part-time use of two others, plus the artillery and engineers of the 82d Airborne Division[7] and some 125 helicopters and 25 fixed-wing aircraft, but less than six weeks to carry out its important work. The test program used over 11,000 flying hours, mostly at low altitude and in landing and takeoff from unprepared areas without tower control.[8] An airmobile task force moved from Fort Bragg to swamps in Georgia to simulate a situation in Indochina; a counter-guerrilla exercise was carried out in the mountains and dense forest of western Virginia; and a third exercise took place in the Fort Bragg area to reenact with airmobile units the situation General Walker faced in his withdrawal to the Pusan perimeter. Sixteen small unit tests beginning in the middle of May preceded these exercises, and some 30 "side tests" took place concurrently.[9] Each tactical mobility, firepower, reconnaissance and target acquisition, logistics, and counter-guerrilla operations exercise was evaluated. Live-fire test comparisons were made between aircraft (helicopter and fixed-wing), and between airmobile 105mm howitzers and 4.2-inch mortars.[10] At Fort Stewart, Georgia "an airborne engineer platoon reinforced with equipment and ten operators from an airborne light equipment company constructed a smooth strip in about 15 hours . . . which permitted the landing of C-130 aircraft."[11] In another test, an infantry company with helicopter lift for one platoon within one hour moved four miles over heavily wooded mountains,

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[6]The exception was the Operations Research Group which was headed by Mr. Frank Parker, president of the Army's Research Analysis Corporation (RAC), who was also a member of the Board's review committee.

[7]Annex O, p. ii. Numerous other units also participated in these tests, including the Air Force Tactical Air Command, which provided C-130 aircraft.

[8]*Final Report*, p. 57. "[O]ne person was killed and eleven injured; sixteen aircraft suffered various degrees of damage."

[9]*Final Report*, p. 1.

[10]*Final Report*, p. 4.

[11]*Final Report*, p. 8.

deployed tactically on the ground, and attacked—a sequence that would have taken 24 hours on foot under the same conditions. "Side tests" covered a number of concepts and materiel ranging from measuring the takeoff and landing distances for C-130, C-123, and AC-1 (Army Caribou) assault transports[12] to testing various ordnance and weapons with Army aircraft, including 1000-pound bombs with 11-second delay fuzes dropped from low altitude by the Army's Mohawk reconnaissance aircraft.[13] General Howze later described these tests as "tactical experimentation" and not "tests" in a scientific sense, but rather a series of trials to see what would work and what would not."[14] Although this description is accurate, any critical inference is unjustified, as we shall argue in the conclusion.

War gaming by the Research Analysis Corporation (RAC) and the Combat Operations Research Group (CORG)[15] was heavily drawn upon in the Board's *Final Report.*[16] A suggestive scenario was an attempted Soviet incursion into Iran through the rough terrain and widely separated passes of the Zagros mountains, which presented strategic mobility planning its most demanding contingency. In this case, the quicker strategic deployment capability of an air assault division resulting from its lighter weight enabled the division to establish positions and begin combat operations against vehicle columns closer to the Soviet entry points. If Red remained on the roads, great damage was done; if he stopped to defend or deploy to eliminate the air assault division's base, his southward movement to the Iranian plateau was delayed, during which time additional conventional heavy forces could arrive to build up a defense line. In addition to its heavy firepower, a big advantage of the air assault division was its ability to

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[12]*Final Report*, p. 10. According to General Howze's later account of the Board's activity, the C-130 pilot in this test may have been a Lockheed test pilot because of stringent Air Force flight safety requirements. Howze, "Howze Board," II, *Army*, March 1974, p. 21.

[13]This particular test is not recounted in either the *Final Report* or its Annex O, Field Test. General Howze's later account in "Howze Board," II, *Army*, March 1974, p. 24, glowingly describes this test as well as mentions that "[T]he Navy sent us not only technicians to show us how to load bombs and check out the system, but also lent us a highly enthusiastic lieutenant commander to teach our boys the fine points of low-level bombing and even gave us a fair supply of napalm canisters and 500-lb and 1000-lb bombs." Annex A, Board Membership, p. 44, lists two Navy lieutenant commanders as members of Group G (Field Tests).

[14]Howze, "Howze Board," II, *Army*, March 1974, p. 21.

[15]RAC was the recent direct descendent of the Operations Research Office (ORO) that was created in the early 1950s and sponsored by Johns Hopkins University to function as an Army copy of the Air Force's RAND Corporation. ORO was apparently "disestablished" because of disagreement with its outspoken president. CORG, a branch of Technical Operations, Incorporated, provided a group of civilian analysts for the headquarters of the newly created Combat Developments Command. Notice that these and other analytical and testing organizations were explicitly mentioned in McNamara's Memorandum to Army Secretary Stahr.

[16]In his March 1974 account in *Army* (p. 21), General Howze—who wrote or rewrote the *Final Report*—said "I did doubt the results [of the gaming] even though they were favorable."

quickly pick up and move to a new position and reestablish its base if seriously threatened by Red.[17]

Information about conditions and possibilities in Southeast Asia was gathered in early July 1962 by a seven-man team that visited Military Assistance Advisory Groups in South Vietnam, Laos, and Thailand, and Marine Corps Task Force 116 Headquarters at Udorn, Thailand. Commanders and staffs were briefed about the Board's activity by the Team's leader, Brig. General Robert R. Williams, who, in turn, requested information and opinions for some of the Board's study groups. One opinion gathered was that Air Force and Marine Corps "officers contacted did not agree with arming helicopters, on the basis that the helicopter does not provide an efficient weapon platform."[18] The visit to Laos provided opportunity to observe logistics support of Meo tribes by air drops and to visit several villages adjacent to hilltop landing strips negotiable only by small, specialized fixed-wing liaison aircraft like the L-28 Helio-Courier or helicopters.

Annex I, Long Range Concepts and Requirements, presented a highly detailed program of research and engineering development for an entirely new generation of aircraft, weapons, electronics, and other items that would be available in 1975, which, according to the group's cost analysis, would have called for increasing the Army aviation RDT&E funding between 1963 and 1968 from $823 million to $1505 million, plus an additional $2.4 billion from 1969 through 1975.[19] Many of these items have yet to be developed, and it would be interesting to learn why. No rigorous rationale was offered for these proposals other than the implicit idea that "improvements" in navigation, target detection, less costly maintenance, and so on, were desirable. The problem such R&D program proposals present is relevant to the proposed TRADOC Battle Labs, as will be discussed in the final section.

The Board's Recommendations

The Board recommended a set of airmobile organizations equipped with rotary- and fixed-wing aircraft. Tables 1 and 2 summarize these. Table 1 displays Army aircraft performance characteristics and unit cost; Table 2 shows the Board's recommended force structure in terms of the types and numbers of units that would possess aircraft, their proposed aviation structure, and troop strength.

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[17]Annex M-7, as recounted in OASD(COMP)(Systems Analysis), *Army Tactical Mobility: Issues and Opportunities*, p. 33.

[18]Annex B, Southeast Asia Trip Report, 31 July 1962.

[19]Appendix I, pp. 32–42.

Table 1

Army Aircraft Characteristics, 1962

Aircraft	Normal Cruise, kn	Max Speed, kn	Empty Weight, lb	Maximum Fuel Cap., lb	Maximum Gross Weight, lb	Basic Op. Wt., lb	Max. Design, lb Internal	Payload, lb External	Normal Fuel Cons., lb/hr	Program Unit Cost, $	Avionics Unit Cost, $	Maint. hr per F/hr
H-13S	75	91	1,913	246	2,850	2,138	466	0	110	48,333	9,009	10.6
H-23G	70	89	1,946	270	3,100	2,176	654	0	100	48,333	9,009	10.1
LOH	110	118	1,200	440	2,450	1,400	400	0	180	135,000	Unk	Unk
UH-1B	110	120	4,485	1,072	8,600	6,668	3,886	3,500	450	235,532	48,349	11.4
UH-1D	110	120	4,649	1,430	8,762	6,901	4,112	4,000	450	295,460	42,349	11.4
CH-1	130	152	16,318	4,100	33,000	17,480	14,000	14,000	2,000	1,743,000	69,349	17.5
Hvy Lift Hcptr.	95	102	17,240	5,800	38,000	17,778	0	17,640	1,170	Unk	Unk	Unk
AC-I	134	157	18,605	4,968	28,500	19,492	9,495	0	642	679,167	46,549	12.3
AC-II	148	222	21,485	11,000	34,000	22,435	9,368	0	2,200	Unk	Unk	Unk
AO-1A	200	265	9,332	1,930	17,200	12,240	1,200	4,000	726	805,007	200,701	5.5
AO-1B	200	265	9,332	1,930	17,200	13,650	1,200	4,000	726	805,007	458,202	5.5
AO-1C	200	263	9,332	1,930	17,200	12,630	1,200	4,000	726	805,007	365,702	5.5
L-28	140	155	2,037	720	3,000	2,200	800	0	60	57,500	8,500	3.8

SOURCE: OASD (COMP) (Systems Analysis), *Army Tactical Mobility: Issues and Opportunities*, p. 59.

NOTE: Fuel capacity can be traded for payload. Fuel and payload combination cannot exceed Maximum Gross Weight. Maintenance hours include all echelons as well as effort required for fueling.

Table 2

Howze Board Recommended Force Structure, Unit Aircraft TO&E and Personnel

No. of Units	Type of Unit	LOH	UH-1B	UH-1D	CH-1	AO-1 (F)[a]	AO-1 (R)[b]	AC-1 (II)	L-23	L-28	Aerial Crane	Total Aircraft per Unit	Personnel per Unit
5	Air Assault Division	106	109	166	48	24	6					459	15,029
3	Air Cavalry Combat Brigade	92	152	72								316	2,562
3	Corps Aviation Brigade	27	22	96	48		12					209	2,450
1	Field Army Aviation Brigade	17	12	74	48							151	2,806
1	Airmobile Corps Artillery (Southeast Asia)	46	49	60		4						159	4,271
4	Corps Artillery Companies	4	39	4		4			4			55	215
1	Special Warfare Aviation Brigade		40	20		20		20		20		120	1,111
5	Air Transport Brigade	10		10	32			80	1		9	142	3,764
2	Air Ambulance Battalion			75								75	552
11	ROAD Division	74	26	52		8	4					164	15,845[c]
3	Armored Cavalry Regiment	74	38	27								139	2,799
2	Army Aviation Company	16	10						4			30	269
2	Corps Aviation Battery	13	10				12		4			39	115
	Total aircraft[d]	3,299	2,828	3,635	779	395	184	656	264	22	58	12,268	

SOURCE: OASD (COMP) (Systems Analysis), *Army Tactical Mobility: Issues and Opportunities*, p. 22.

[a](F) denotes Mohawks employed in a fire support role.

[b](R) denotes Mohawks used for reconnaissance.

[c]Personnel for Infantry Division.

[d]Totals include aircraft for schools, training allowance, maintenance float, prestockage, and other TO&E units. Grand total includes 748 L-19s and L-20s, primarily assigned to schools and training allowance.

Except for the H-13 and H-23, the aircraft shown in Table 1 were either recently developed or under development. The heavy lift and light observation helicopters (LOHs) were under development. Several contractors were developing prototype LOHs (dubbed "Loaches" by the troops). The OH-6A Cayuse was first delivered in 1966; the OH-58A Kiowa, in 1969. The CH-54 Sky Crane first delivered in 1966 became the heavy lift helicopter indicated in Table 1. Its internal payload was 15,400 pounds; external payload, 20,700 pounds. All helicopters except the H-13 and H-23 had turbine engines. The Bell UH-1 was originally intended to be an air ambulance and was well broken-in. The UH-1B was armed to function as a gunship until a specially designed one became available.[20] The Vertol CH-1 Chinook was new and plagued with so many problems that some regarded it as a "disaster."[21]

The AO-1 Mohawk was the result of a Navy project to develop a twin-engine turboprop reconnaissance aircraft for the Marine Corps. As it ran into development problems, the Navy sought to get Army funding. The Navy abandoned the project when carrier landings appeared improbable. Although it was overweight and underpowered, from the Army's viewpoint it was a relatively high-performance aircraft. Although intended to be an observation aircraft, it also possessed hard points for ordnance delivery, and the Mohawk functioned as a close-support aircraft in the Board's field tests.

The AC-1 Caribou was an off-the-shelf de Haviland twin-engine, high-wing commercial cargo transport designed to operate in the north Canadian wilderness. Its rear-end loading feature lent itself to military combat airlift and resupply. Although its capacity was less than a third of the Air Force C-130's, its short-field operating ability and "ground bearing" was superior.[22] The L-28, a fixed-wing liaison aircraft with exceptionally short landing and takeoff capability, seemed to lend itself to liaison and observation, and was faster and less expensive than a helicopter.

Table 2 shows the Board's recommended program in terms of new units it proposed, the numbers and kinds of aircraft each unit should be equipped with,

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[20]The UH-1B was followed in 1965 by the higher-performance UH-1C, which was armed with a slewable 40mm grenade launcher and 2.75-inch rocket pods. The AH-1G Cobra followed in 1967 with a streamlined airframe designed for a two-man crew but with heavier armament, including a mini gun and ability to launch guided missiles. See Lt. General John J. Tolson, *Air Mobility, 1961–1971*, pp. 273, 276.

[21]The Chinook's twin-rotor design was responsible for troublesome vibration moments that were much more serious than was normal with new helicopters. (The proponent for its development was the Transportation Corps.)

[22]"Ground bearing," which was measured by the "California Bearing Ratio" (CBR), described weight in pounds per square inch that a vehicle's footprint imposed on the ground surface.

unit personnel strength, and the number of these units the Army should program. This program was one of five considered and described in the *Final Report* and its Program and Budget Annex,[23] and was intended for the programmed 16 active Army divisions, with the five air assault divisions replacing three infantry and two airborne divisions.

The Board's recommendations can best be appreciated with a description of the TO&E building blocks shown in Table 2.

Proposed Tactical Units and Aircraft Assignments

The Air Assault Division. This organization caught the most attention. It would contain 459 aircraft as compared with about 100 in the existing ROAD division. Airlift capability would be improved by a major reduction of ground vehicles from 3452 to 1000.[24] Division artillery consisted of 105mm howitzers[25] and Little John rockets air transportable in CH-1 helicopters. To offset reduced ground artillery firepower resulting from elimination of 155mm and 8-inch howitzers, the division would employ 24 Mohawk aircraft and 36 UH-1 helicopters armed with 2.75-inch rockets. Division aircraft would provide capability to lift one-third of its infantry at a time.[26] Rifle companies would have no vehicles and would own only direct-fire weapons; heavy weapons would be centralized at battalion level.[27]

The Air Cavalry Combat Brigade. This unit, containing 316 aircraft (including 144 attack helicopters), was conceived for armored warfare and would be equipped with anti-tank missiles. It could also be used for counterinsurgency operations when equipped with anti-personnel instead of anti-tank weapons.[28] Unlike the air assault division, which would join battle on the ground, it would rely on aerial firepower. Its 316 aircraft and 2562-troop strength would allow its infantry to be lifted all at once.

The Corps Aviation Brigade. This unit would provide lift sufficient to move three ROAD infantry battalions or one 105mm field artillery battalion, and

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[23] *Final Report*, pp. 88–92, and Annex G, Program and Budget.

[24] *Final Report*, p. 82.

[25] At the time the Army was struggling to develop the XM102, 105mm howitzer, which was designed to be lighter than the then-current M2A2 howitzer. Its lower weight required a muzzle brake to deflect some of the recoil. Unfortunately, the resulting back-blast occasionally ruptured a gunner's eardrums, which generated a requirement for gun crews to wear earplugs.

[26] *Final Report*, pp. 36–39.

[27] *Final Report*, p. 38.

[28] *Final Report*, p. 41.

reconnaissance capability for the use of corps commanders. It would also contain a general support battalion for command and control, surveillance, and air traffic control and identification.[29]

The Army Aviation Brigade. This function is similar to that of the corps aviation brigade, although this organization's structure is tailored to Europe.

Airmobile Corps Artillery. This unit—designed for undeveloped areas—would have 159 aircraft including attack helicopters and air transportable artillery consisting of 105mm howitzers and Little John and Honest John rockets. The unit would also possess target acquisition capability in the form of four fixed-wing reconnaissance aircraft and 46 observation helicopters.[30]

Special Warfare Aviation Brigade. This unit would contain 120 aircraft, organized into five Special Warfare Aviation Detachments (SWADs) available to support Special Warfare troops. Each SWAD would contain four attack fixed-wing aircraft (Mohawks), four fixed-wing transports (Caribou), four Chinook transport helicopters, four light fixed-wing aircraft (L-28 or L-19), and eight UH attack helicopters.

Air Transport Brigade. These units would consist of 80 AC-1 or AC-2 (Caribou) fixed-wing cargo aircraft, 32 medium helicopters, and 9 heavy-lift helicopters. They would perform a logistics distribution function from airfields in the Army area (to which point supplies were delivered by the Air Force) to divisions and brigades. One air transport brigade could provide "limited" logistic support for an air assault division over a distance of 175 miles.

Air Ambulance Battalions. These units were to provide medical evacuation.

Aviation Augmentation of Other Units. The Board recommended major increases in aviation assigned to conventional Army units, especially infantry and armored divisions and armored cavalry regiments. The ROAD division would contain 164 aircraft instead of the planned 101, including eight Mohawk fire-support aircraft. Armored Cavalry Regiment aircraft would increase from 26 to 139, including 21 tactical troop transports and 30 attack helicopters.

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[29] *Final Report*, p. 52.

[30] *Final Report*, p. 45. The Board also recommended that existing corps artillery, with its aviation company of 16 aircraft, should be provided an "aerial rocket battalion of 39 attack helicopters."

Estimated Additional Cost of the Board's Favored Program and Proposed Deployment

The Board recommended that the aviation-intensive force structure shown in Table 2 be implemented during the five-year FY1963–1967 period, or by 1968. Compared to the then-current program, it called for the following active force program and cost changes:[31]

Requirement	Current	Proposed
Aviators	11,500	20,600
Aircraft	4,878	8,317
five-year cost (billions)	$65,146	$69,371

The additional cost of the Board's program was $4225 million after taking credit for nearly $2000 million savings in ground vehicles that the program change would allow.[32] The following deployments were proposed:

- Air assault division: three in the United States, one in Hawaii, and one in Korea
- Air cavalry brigades: two in the United States, and one in Europe
- Air transport brigades: one in the United States, two in Europe, and two in the Pacific.

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[31] *Final Report*, p. 89.

[32] *Final Report*, p. 74. Included in these cost savings were 1866 main battle tanks, 2324 armored personnel carriers, and nearly 11,000 jeeps, 15,000 2-1/2-ton trucks, 5000 5-ton trucks, and 9000 1-1/2-ton trailers. The estimated cost savings took no account of the strategic mobility cost savings (or benefits) the proposed program might provide.

4. Reactions to the Board's Effort

The Air Force reacted strongly to the Howze Board.[1] A board of Air Force officers headed by Lt. General Gabriel Disosway in a four-volume report predictably and strongly contested the Howze Board's recommendations on technical and doctrinal grounds.[2] Its technical arguments criticized the use of helicopters as weapon platforms, and asserted that Air Force fighter-bombers provided more effective fire support. Especially distressing was the idea of the Mohawk as a close-support aircraft and, particularly, that it be organic to Army divisions. (Table 2 above shows 395 fire-support Mohawks in the Board's recommended program, including 24 for each air assault division and eight for each of the remaining 11 ROAD divisions.) Here the real issue was not about technology, but about "roles and missions" and "centralized" versus "decentralized" management and command of aircraft.[3] This reaction surprised no one. The new Secretary of the Army, Cyrus Vance, and the new Chief of Staff, General Earl Wheeler, strongly endorsed the Board's main idea of air cavalry, and the roles and missions issue was clearly presented to the Secretary of Defense and other senior policymakers.

What seemed extreme was the proposed number of air assault divisions and air transport brigades, five of each. The OSD staff review did not question the possible merits of the air assault division and air cavalry brigade concepts, but it was critical of five air transport brigades with their 400 Caribou transports and 108 HC-1 Chinook helicopters, in view of the much greater transport productivity of Air Force C-130s that had already been procured or funded.[4]

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[1]The Air Force, of course, was aware of Secretary McNamara's Memorandums to the Army, and was formally requested by Deputy Secretary Gilpatric to provide the Board support, particularly C-130 transports for some of the tactical tests. It also sent a brigadier general to monitor the activity at Fort Bragg who "was privileged to see all tests and exercises and could interview anyone he chose, but we did not invite him to sit with the steering committee, and all subcommittees were privileged to exclude him" (Howze, "Howze Board," II, *Army*, March 1974, p. 20).

[2]United States Department of the Air Force, Tactical Air Support Requirements Board, *United States Air Force Tactical Air Support Requirements Board Comments on Report of Army.*

[3]It should be recognized that debate and bureaucratic struggle over roles and missions almost always focus on a weapon or some item of equipment. The debate, however, is seldom over the merits of the system, but rather over such abstractions as organization or management philosophy. In the case of the Mohawk, the Howze Board confronted head-on the Air Force's insistence on central management of aviation resources. For an expression of the Air Force position, supported by historical examples, see General William W. Momyer, *Air Power in Three Wars* (WWII, Korea, Vietnam), Washington, DC, Government Printing Office, 1978.

[4]Here the issue was not whether there should be any Caribous, since 117 had either been procured or funded through 1963. Rather, it was about the mix of C-130s and Caribous. Moreover,

Moreover, the Board's war gaming indicated that in non-Europe campaigns such as Iran and Korea only two air assault divisions were necessary, so the five-division proposal may have assumed two simultaneous limited wars or a major war in Europe; however, in the Board's European analysis only division battles rather than a full campaign was studied, so there was no analytical support of how many air assault divisions could be used.[5] As for the Mohawk and the roles and missions issue it presented, OSD analysis accepted the Army argument for control of close support aircraft, but questioned whether the Mohawk was the best machine for the job,[6] and left open whether such an aircraft should be organic to the division or attached to a higher echelon.[7] It also raised the question of whether a fixed-wing aircraft like the L-28 could be substituted for some of the more costly and slower LOHs. Nevertheless, it was obvious the Board presented a coherent plan and set of concepts, but—as the Board itself pointed out—more testing and study needed to be done. To continue the Board's work, the Defense Secretary approved increasing Army troop strength for FY1964 to 975,000 from 960,000 to create a provisional air assault division and an air transport brigade for further testing and evaluation.

In February 1963, the 11th Air Assault (Test) Division was activated at Fort Benning, Georgia, to undertake a three-phase test program. Army Chief of Staff General Wheeler instructed its newly designated commander, Major General Harry W. O. Kinnard: "You are going to run the organization. I want you to find out how far and fast the Army can go, and should go in the direction of air mobility."[8] It was an innovative approach to Army combat development. As one involved officer later put it, "For the first time in the history of the Army, a bunch of people had been turned loose with a high priority on personnel and

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the Board's logistics analysis of an ALOC assumed that C-130s required a 4400-foot runway at an advance airhead, which was valid for a full-load takeoff but unnecessary for landing with a load and an empty takeoff, for which a runway of half the length might do. This and other key assumptions were critical to the worth and necessity of such major force structure proposals. OASD(COMP), Systems Analysis, *Issues and Opportunities*, pp. 19–24.

[5]OASD(COMP), p. 40.

[6]OASD(COMP), pp. 11-15.

[7]OASD(COMP), pp. 48-49. The distinction between "organic" and "attached" in Army lexicon is relevant to the concept of the division as the basic Army combined arms unit, which should "possess," or have "organic" to it, those specialized arms and services it would use in normal combat operations. Other specialized or additional capability is "attached" to the division by higher headquarters—corps or army—on an "as needed" basis. This approach to organization means that the extent to which command is "centralized" or "decentralized" is necessarily flexible. Air Force doctrine rejected this approach in its relationship with other services, particularly the Army. However, as a practical matter it often surmounted the constraints implied by such an abstraction, as illustrated by the fact that it seldom consistently adhered to its central management doctrine. For example, at one time both the Tactical Air Command (TAC) and Military Airlift Command (MAC) owned C-130s, both TAC and Strategic Air Command (SAC) once owned fighters, and so on.

[8]Kinnard interview, p. 16.

equipment, and told, O.K., here's the dough, we'll get the people and equipment; [you] come up with a concept and prove it."[9]

The division's initial cadre was 291 officers, 187 warrant officers, and 3114 enlisted men.[10] Equipment and aircraft were stripped from units across the country, and helicopter factory production was increased. An intense period of practice and training, and scrounging of equipment (often directly from civilian sources) in preparation for a series of tests followed. Safety standards were relaxed to allow low-altitude and night flying, and the regulation not allowing helicopter formation flying was ignored. A separate Test and Evaluation Group headed by Brig. General Robert Williams was established at Fort Benning.

In September 1963, a battalion-size exercise, AIR ASSAULT I, was carried out by air movement to Fort Stewart, Georgia, which provided more maneuver room than Fort Benning. Meanwhile, two major tests were planned for the fall of 1964. One was a joint Air Force-Army test, GOLD FIRE I, near Fort Leonard Wood, Missouri, under the U.S. STRIKE Command using the Army's First Infantry Division and Air Force Tactical Air Command resources, to test the Disosway Board contention that the combination of a selectively tailored ROAD division—C-130s, Air Force reconnaissance and close air support, *and no fixed-wing Army aircraft* or medium helicopters—would provide a more effective and flexible approach to tactical mobility than would the air assault division.[11] Between 14 October and 12 November, the 11th Air Assault Division maneuvered against the 82nd Airborne Division in the Carolinas demonstrating, often in adverse weather, that the Air Assault Division could seek out opposing forces and rapidly concentrate to destroy them. In early March 1964, the Secretary of Defense ruled with respect to the STRIKE Command joint testing that the Army continue its unilateral testing until the end of the year, at which time it would be decided whether future joint testing be undertaken.[12]

By early 1965, it was evident that the testing phase of the 11th Air Assault Division was nearing its end and that it would be disbanded. Meanwhile, increasing military resources were being sent to South Vietnam.[13] After the

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[9]Seneff interview, quoted in Stanton, *Anatomy of a Division*, pp. 25–26.

[10]Stanton, *Anatomy of a Division*, p. 28.

[11]Tolson, *Air Mobility, 1961–1971*, pp. 57–58. According to Tolson, GOLD FIRE I "proved that with overwhelming use of dedicated Air Force support, a standard Army division had increased potential."

[12]Tolson, 1973.

[13]In mid-1962, a UH-1 Tactical Transport Helicopter Company armed with light machine guns and 2.75-inch rockets was sent to Vietnam and functioned as escorts for CH-21 helicopters.

After his work with the Howze Board, General Rowney headed an Army Concept Team in Vietnam to evaluate Army aviation. Six armed Mohawks appeared in Vietnam in September after

spring of 1965, when Marines and the Army 187th Airborne Brigade arrived in Vietnam, the Army faced the problem of deciding which unit should be sent to the rugged and threatened Central Highlands with its important city of Pleiku. None of the Army's divisions seemed suitable—the airborne had limited ground mobility, and armored and ordinary infantry divisions were too heavy or too dependent on vehicles. In discussion of this problem at an Army Policy Council[14] meeting, General Abrams declared with respect to the air assault division, "I feel it extremely propitious that we happen to have this organization in existence at this point in time, and we will deploy it to Vietnam."[15]

Thus the air assault division received a new lease on life. The Combat Developments Command hastily wrote new TO&Es for it: 15,787 officers and men, 434 aircraft, 1600 vehicles, eight infantry maneuver battalions, an air cavalry squadron, and three brigade headquarters.[16] A casualty for the Howze Board's recommendations, however, was loss of the 24 armed Mohawks. General Kinnard disagreed with Army Chief of Staff General Harold Johnson's decision but later opined that General Johnson "had to sacrifice that on the altar of overall accord with the Air Force."[17] On 1 July 1965, General Johnson made a less substantive but sentimental decision when he activated the 1st Cavalry Division (Airmobile) with resources from the former 11th Air Assault (Test) Division and the 2nd Infantry Division stationed at Fort Benning.[18] The new organization had 90 days to begin deploying to Vietnam, which required hectic activity to process personnel replacements and acquire and prepare equipment for shipment. Ironically, and to General Kinnard's dismay since he had been an airborne soldier during most of his career, except for a 1000-man advance party the division had to reach Vietnam by aircraft carrier and three overloaded transports during a 21-day sea voyage from Mobile, Alabama, and Jacksonville, Florida. By the third of October, the entire division was located at its base area at An Khe in the Central Highlands. By mid-October the North Vietnamese Army began building up forces and assembling three regiments in the region. General

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heated debate in the Pentagon. During the latter half of 1961, a Caribou under the auspices of the Advanced Research Projects Agency operated in Vietnam. For an account of these and other phases of Army aviation in Vietnam before the major U.S. buildup, see Tolson, 1973, pp. 25–50.

[14]The Army Policy Council consisted of the politically appointed civilian secretariat, the Chief and Vice Chiefs of Staff, heads of the General Staff Sections, the Secretary of the General Staff, and the heads of several offices or special assistants assigned to the Office of the Chief.

[15]Stanton, *Anatomy of a Division*, pp. 35–36.

[16]Tolson, *Air Mobility, 1961–1971*, p. 59.

[17]Kinnard interview, p. 17. Tolson, *Air Mobility, 1961–1971*, p. 62, explained that General Johnson remarked that 60 percent of his time in the joint (JCS) arena was devoted to the problem that the Mohawk presented regarding Air Force control of air support.

[18]General Johnson served with the First Cavalry Division (which was actually an infantry division) in the Korean War. As part of this renaming, the former First Cavalry in Korea was redesignated the Second Infantry Division.

Westmoreland on 27 October ordered General Kinnard "to seek out and destroy this enemy force." The month-long Battle of the Ia Drang Valley and the highly successful testing of the Army's tactical mobility innovation began.[19]

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[19]Tolson, *Air Mobility, 1961–1971*, p. 73. For an account of the differing views that General Westmoreland and General Kinnard had about the use and deployment of the division, and how the difference was settled, see Stanton, *Anatomy of a Division*, pp. 39–40.

5. Relevance of the Howze Board to Future Combat Developments

The Aviation Controversy and the Howze Board

If combat development is a successful search for how technology can be exploited to create new capability, the Howze Board was successful. It should nevertheless be recognized the Board had three roots. One was World War II organic Army aviation where artillery aircraft provided highly responsive capabilities in addition to its primary function of target acquisition and artillery fire observation. A second was reinvention of the classical cavalry concept by General Gavin. The third was Secretary McNamara's idea of replacing ground transportation with aircraft. Also strongly influencing both the Board and reaction to its recommendations was the long history since 1942 of AAF and Air Force behavior and exposition of its doctrine, and past Defense Department policymakers who had constrained Army aviation by arbitrary rulings.

It was General Howze's unique contribution when armed with the McNamara directives to focus on and adhere to General Gavin's cavalry concept.[1] General Howze, who wrote or rewrote most of the Board's *Final Report*, had a clear and well-defined conceptual model of air cavalry in his mind at the Board's beginning and throughout its deliberations. Thus, the Board's recommendations, although mildly surprising, were compelling enough to provide resources to create and support the 11th Air Assault (Test) Division.

Creation of the 11th Air Assault (Test) Division was not the only positive decision that might have been made. For example, General Howze's personal recommendation to Army Secretary Vance and Chief of Staff General Wheeler was to make the 82nd Airborne Division airmobile.[2] But instead the Test Division was created. Why? One reason was that some issues needed further

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[1]Shelby L. Stanton, "Lessons Learned or Lost: Air Cavalry & Air Mobility," *Military Review*, January 1989, pp. 75–76. In this article, Stanton argues that the Army's present structure is still a far cry from the Howze Board's recommendation and that "a continuing need exists to fuse traditional cavalry doctrine with . . . novel aircraft and weapon systems" (p. 86).

[2]See Howze, "Howze Board," III, *Army*, April 1974, pp. 23–24. General Howze also expressed regret over the fact that the air cavalry combat brigade, which possessed helicopter lift for all of its troops, was not adopted, and at the time of writing this article asserted the Army badly needed some of these units (p. 20).

testing, and to expect a division intended to implement important contingency plans to carry out a test program as well seemed risky. There was also reason to expect that if the air assault division and its 24 close air support Mohawks had been immediately approved, the Air Force might openly revolt or at least secretly try to get congressional supporters to oppose the decision. Meanwhile, a continuing test program, including the STRIKE Command testing, would keep prodding the Air Force to find ways to use its airlift more imaginatively and to pay more attention to implementing its Army support missions and responsibility—which, in fact, happened. Thus, the Howze Board was also a means of converting "roles and missions rivalry" into "healthy competition."

As an approach to combat developments, creation of the Board explicitly opened the Army-Air Force debate about aviation and announced OSD rejection of past ad hoc rulings that restrained the Army's opportunity to exploit aviation technology. To assess the Board's role in serving this end, however, two questions should be asked: First, given the history of Army-Air Force disagreement about aviation management, command, and control of aircraft and the way civilian leaders had resolved the issue, was the Howze Board the best or only way to open the debate? Second, could the issue have been resolved earlier and more effectively? Army-Air Force disagreement most sharply came to a head with respect to "close air support." At the risk of angering some readers, it is helpful to summarize the opposing arguments.

The Close Air Support Issue

The Army's position on close air support contained three points. First, it wanted to use it in the detailed, small-unit fire-fight that usually took place over a few hundred to a thousand yards. In armored and mechanized operations, these were characterized by rapid movement and short duration. In a large operation, many small-unit contacts take place almost simultaneously, so there is need for many simultaneous sorties, as well as specially trained crews who in highly confused situations can distinguish friendly from unfriendly force elements.

The second point rests on scheduling and timing. In both mechanized and air assault operations, the air support must be closely timed to coordinate with a ground attack or active defense. In the case of air assault of an enemy position, a delay of even several minutes between fire support to suppress enemy fire and the insertion of friendly assault troops can enable the defender to improve his position greatly. The Army believed that only by Army control of aircraft could this critical scheduling problem be solved. Finally, since the division is the primary Army combined arms unit and since the Army would like habitually to

use close air support in its combat operations, the aircraft should be organic to its primary combat unit.

Air Force counter-arguments emphasized that the speed of costly aircraft enabled them to be concentrated like no other weapon, and that they therefore should be centrally controlled. Furthermore, the air battle to obtain air superiority demanded both large numbers and the highest aircraft technical performance, and was the "first requirement for the success of any land operation."[3] Since ground attack of enemy air bases was part of the air battle, multipurpose fighter-bombers were preferred; the negative side of this doctrinal assertion was to resist strongly specialized ground attack aircraft like the World War II Navy and Luftwaffe dive-bombers. Endowing the high-performance fighter-bomber with capability to provide close air support required a small incremental cost, it was claimed. This greater cost strengthened the argument for centralized control.[4]

Stated in these abstract terms, both arguments are seemingly both compelling and irreconcilable. But the central management argument had an implicit technical underpinning and accepted a contestable campaign model. The technical argument was that a multipurpose aircraft, for which close air support capability might entail a "small" additional cost, is best. But was (and is) this really so? In most technical applications—as in automobiles, ships, and home appliances—specialized functional designs prevail. Moreover, the quest for multipurpose capability increases development and procurement cost, and "multipurpose" designs often turn out to perform one or more of their multiple functions poorly. In any case, key assertions implicit in the abstract central management argument are testable. But little testing of aviation and related tactical doctrine, including Army forward-area air defense, had been carried out.

The airman's campaign model that ranked air superiority, interdiction, and close air support in descending priority[5] is contestable. First, it can be argued that the best way to win air superiority is in air battles that take place while performing army (and naval) air support. Such was the experience of the RAF's Desert Air Force during 1941 and 1942. In the 1942–1943 Solomons campaign, Japan's most experienced carrier pilots operating from land bases were destroyed while supporting ground and naval operations. Moreover, is a multipurpose aircraft the most effective way to destroy enemy fighters, or is a specialized air

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[3]War Department Field Manual 100-20, *Command and Employment of Air Power*, July 21, 1943.

[4]It also ensured that Air Force R&D was directed toward multipurpose aircraft and away from specialized close support types.

[5]Goldberg and Smith, *Army-Air Force Relations: The Close Air Support Issue*, p. 3, states "Close air support—attack on ground targets in the 'zone of contact'—received third priority among tactical air missions, ranking behind air superiority and interdiction."

superiority fighter best? This was also a technical or design issue. These issues, of course, have been argued endlessly. But little well-structured and rigorous testing of the critical behavior propositions implicit in these augments had been undertaken. Second, what, exactly, does assigning top priority to the air battle mean? Would an air commander attack a distant enemy airfield during a potentially campaign-winning ground battle when friendly troops sorely needed close air support? Probably not. If not, is not the priority ordering overruled by common sense?

Only in the case of the Mohawk did the Army briefly face the issue and confront Air Force doctrine, but it later backed away when General Johnson withdrew the 24 fire-support Mohawks from the 1st Cavalry Division in order to keep peace with General LeMay.[6] (Later, General Johnson also turned the Caribou transports in Vietnam over to the Air Force.) But apart from demonstrating that the Mohawk could carry and drop bombs, there were no rigorous tests of different close air support systems and methods, under differing conditions and command arrangements, and so on. Nor could there possibly have been any, given the short time available for either the Howze Board's deliberations or, for that matter, the two years to test the 11th Air Assault Division itself. However, these shortcomings should not be attributed to the Board, the Air Force, or the management of the 11th Air Assault Division test program. The fault lay with the approach to post–World War II aviation combat developments and acquisition. Given these conditions, the Howze Board and the 11th Air Assault Division were a "quick and dirty" approach. Creation of the air assault division was cheap and not very risky because new helicopters procured for it could be put to less bellicose uses like medical evacuation and troop lift if it turned out that the air cavalry concept could not be implemented. Even so, the Howze Board was no way to carry out combat development.

How Should Combat Developments Be Conducted?

During the roughly two-month period that most of the Board's activity took place—the gaming, field tests, logistics analysis, and so on—too many things went on simultaneously and within too little time. As General Howze acknowledged, the Board "made no real 'tests' in a scientific sense but conducted rather a series of trials to see what would work and what would not."[7] Like the

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[6]Some would argue that attaching weapons to helicopters confronted the Air Force. If so, the question remains exactly how the Air Force was "confronted." Was it the idea of the helicopter as a weapon platform? Or was it Army ownership of an air weapon?

[7]Howze, "The Howze Board," II, *Army*, March 1974, p. 21.

Fort Rucker experiments, the Board's field testing provided useful knowledge about techniques like formation flying, how quickly a detachment of engineers could clear a helicopter landing ground, and so on. With enough of this kind of information, organization designers can start thinking about possible testable hypotheses. However, such tests do not provide the kind of information needed to make decisions about tactics and, especially, weapon performance characteristics and acquisition.

Let us return to the Army-Air Force close air support issue to illustrate a more deliberate approach to combat development. First, it might have been possible to structure explicitly "models" of the opposing Army and Air Force arguments so as to specify, for example, the distances within which pilots must identify and acquire targets to support assaulting infantry (or tank-infantry teams), and the time differentials within which such support would be needed or most valuable, to identify criteria or measures of merit to quantify the concepts of "responsiveness" and "close" support. How long does it take fixed-wing fighter-bombers to reach an objective area? Do pilots first have to make a pass over a target to fix it before delivering ordnance, and if so, what is the additional exposure to forward air defense systems? Such reactions are obviously sensitive to terrain, enemy target systems, weather, pilot skill or specialized ground support training and experience, and so on. Similar questions apply to helicopters employing pop-up and pop-down flying tactics. With these models, it would have been possible to design a sequential program of instrumented field trials—including an experimentation matrix allowing different degrees of pilot training, time of day, visibility, organic vs. non-organic aircraft, and so on—that would provide measurements and "real" data to use in the models. Moreover, insight gained from observing structured field trials helps refine and improve future models. For instance, what difference does it make whether pilots train with the ground units they must cooperate with? A "bonus" by-product of such experiments is the occasional "outlier" that suggests new possibilities.

Designing experiments also requires preliminary tests and experiments of firing doctrine, flight approaches, communication techniques, and crew training, and calibrating instrumentation necessary for a field experiment. Testing close air support responsiveness would have been only part of a necessary program. Safety requirements and other constraints would have required separate live-fire experiments to evaluate different firing techniques, kinds of ordnance necessary to "kill" or supress targets, degrees of crew training, etc. A thorough program of sequential testing in the context of enemy forward air defense—and by implication a simultaneous testing of air defense systems and tactics—would also have been necessary. However, such a body of real knowledge, as contrasted

with doctrinal assertions based on such vague concepts as "responsiveness," "close" air support, "centralized" command, was not available. Instead, Vietnam provided the needed "experiment."

Some Recommendations for TRADOC and Its Battle Labs

Like that of the Howze Board, the focus of TRADOC's Battle Labs cuts across specialized branches and services. Their directed objective is to determine how to exploit technology and define weapon performance requirements to "ensure our soldiers have a technology edge on future battlefields."[8] It appears they intend to rely "heavily on the use of simulations and virtual prototyping to test new equipment before they are tested under actual field conditions."[9] A simulation, of course, requires a model. The Army has accumulated a large inventory of combat models, and new ones are forthcoming. If it is to provide useful information, a model requires data or numerical inputs to specify constraints, and the Army and the Defense Department possess a gigantic amount of statistical material, much of which was produced by model simulations. These conditions present the Battle Labs concept a major problem: Which model should be selected to carry out a simulation and virtual prototyping? Has a selected model been validated? Equally important, how valid, in an empirical sense, are the data inputs? And, if some "data" are the output of a model, how valid is the theory on which *that* model was based? Have the assertions flowing from a simulation been verified? These are weighty questions that present major issues for combat development and, especially, for the identification of weapon performance and physical characteristics that are to be the object of engineering development. They have not received careful attention. The Battle Labs should raise these questions as they proceed with any simulations they undertake, both about a model's structure[10] and the data on weapon performance, target acquisition and identification, terminal munitions effects, and the like that are used in a model.

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[8]Document transmitted by Lt. General Schoffner for the Commander, TRADOC, 20 August 1992, p. 3.

[9]"Battle Labs," *Army Logistician*, March-April 1993, p. 15.

[10]A model's structure should be described in terms of the number and form of the equations and inequalities that compose the model, the number and identification of "unknowns" for which it provides a numerical solution by means of a simulation, and any prior assumptions or constraints the modeler uses about equation behavior—for example, whether certain first derivatives are held to be positive or negative. Edited data used in a model as well as the data source should be explicitly described.

In raising such questions, the Battle Labs would perform a quality control function for the Army's study activity. Ad hoc tests like those of the Howze Board and at Fort Rucker during the 1950s, and similar tests carried out by test boards at Army Centers, often provide suggestive hypotheses about or insight into how combat models might be structured. But generally they do not provide information keyed to model building, nor do they validate or refute the assertions of models. There are other data sources such as the Experiment and Operational Testing and Evaluation Commands, and, on occasion, it might be possible to piggy-back an experiment onto training activity like that of the Desert Training Center. However, few of the Army's extensive testing activities produce data that verify or refute hypotheses derived from its models. Conversely, seldom do models produced by or for the Army indicate the empirical effort that would reduce the uncertainty that shrouds the model's findings as revealed by the usual "sensitivity analysis." But unless models and their assertions are tested by appeals to independently produced data, the basis for producing future innovation—including the specification of weapon characteristics that effectively and efficiently exploit new technology—will be weak and ad hoc. Doctrinal assertions, disguised by simulations of unverified models fed by data that are the outputs of other unverified models will continue to rule the day, and will obfuscate rather than clarify. Nor is this any way to carry out and guide combat developments.[11]

These conditions suggest that the Battle Labs give attention to the problem of finding ways to attain a better interactive relationship between the Army's model building and its empirical testing activity. One way to accomplish this objective would be for the Battle Labs to identify and even design programs of sequential field experiments, perhaps in cooperation with the relevant testing agencies. They might even create experimentation project teams of officers and civilians with formal training in operations research and experimental design that would design an experiment, observe and participate in its field trials, and evaluate the data. However, alternative mechanisms that would help connect more closely the Army's model-building and its testing activity should be conceived and evaluated.

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[11]For a detailed criticism of military modeling that has blossomed since the early 1960s, see J. A. Stockfisch, *Models, Data, and War: A Critique of the Study of Conventional Forces*, RAND, R-1526-PR, 1975. This study is dated because the gap between model production and empirical work has continued to grow. See also Paul Davis and Donald Blumenthal, *The Base of Sand Problem: A White Paper on the State of Military Modeling*, RAND, N-3148-OSD/DARPA, 1991. These papers treat different phases of military modeling. The Davis-Blumenthal paper is concerned with modeling large force aggregations. R-1526-PR concerns "fine grain" modeling of small unit engagements and weapon effects when the model's assertions are used to influence weapon design and acquisition, small unit tactics, and the like. The two branches converge, however, with the "scores" or "measures" assigned to large aggregations like army divisions, insofar as practitioners of both fine- and coarse-grained models may well wonder where those scores come from.

One lesson the Howze Board taught about the combat developments process was that real effort beyond the initial idea phase (such as General Gavin's air calvalry concept) had to be accomplished outside the Army's then-existing school system, free of the doctrine and dogma of those who teach the status quo. It may also be that the project leader of a major combat development has to be a key current military commander, as was General Howze. Even so, such ad hoc groups or boards should have sufficient time, with the aid of qualified scientists with operations research and experimental statistics background, to lay out and implement a sequential testing program. The Battle Labs would do well to try to anticipate the issues that might become the subjects of future boards, and identify some of the critical behavior issues that could be resolved by testing.

Appendix

Secretary McNamara's Memorandums

THE SECRETARY OF DEFENSE

Washington

April 19, 1962

MEMORANDUM FOR THE SECRETARY OF THE ARMY

SUBJECT: Army Aviation (U)

This is in response to your two November 1, 1961, memoranda which discussed Army Aviation and presented the Army's proposed procurement program.

These studies greatly enhanced my understanding of what the Army is seeking to achieve through its organic aviation. However, the quantitative procurement programs fall considerably short of providing, in the near future, modern aircraft to fill the stated requirements. While it appears to me that the Army can and should turn increasingly to aviation to improve its tactical mobility, your memoranda do not give a clear picture regarding either the optimum mix of aircraft types or the absolute total numbers that will be required.

Attached is an analysis of your studies made by my office. I would like your comments on this analysis with particular emphasis on the proposed increased buy of Army aircraft for 1964 and on the position that your predicted requirements in this area through 1970 are too low. These comments should be submitted by 15 May 1962.

Furthermore, I would like the army to completely re-examine its quantitative and qualitative requirements for aviation. This re-examination should consist of an extensive program of analyses, exercises and field tests to evaluate revolutionary new concepts of tactical mobility and to recommend action to give the Army the maximum attainable mobility in the combat area. It appears to me that air vehicles, operating in the environment of the ground soldier but freed from the restrictions imposed by the earth's surface, may offer the opportunity to acquire quantum increases in mobility, provided technology, doctrine, and organization potentials are fully exploited. I believe further that these mobility increases can be acquired without increased funding by reducing less effective surface transportation systems concurrently. The Army's re-examination should therefore give special attention to the following:

(1) To what extent can aviation be substituted for conventional military surface systems of vehicles, roads, bridging, engineer troops, theater supply and hospital complexes, etc?

(2) Should newer concepts of VTOL or STOL fixed-wing aircraft be substituted for helicopters, as a means of avoiding some of the high procurement and operating costs of helicopters?

(3) May we use heavy tactical airlift, combined with new techniques in air dropping and possibly better airlift construction and repair capability, to provide part of the logistic support for ground operations? There should be considered the possibility that Air Force lift may be available, after the first thirty or so days of a strategic lift, to augment Army tactical lift capabilities.

(4) What qualitative requirements can be defined for immediately developable V/STOL air vehicles optimized for such purposes as surveillance, target acquisition, weapons platforms, command posts, communications centers, or troop and cargo carriers of significantly heavier loads?

(5) What organizations and operational concepts are required to exploit the potential increases in mobility? Consideration should be given to completely airmobile infantry, anti-tank, reconnaissance, and artillery units.

(6) What other concepts and ideas, as well as major limitations, bear on this subject? We should seriously consider fresh, new concepts, and give unorthodox ideas a hearing.

The results of the study should be presented in terms of cost-effectiveness and transport-effectiveness factors. The study should involve the full use of field tests and exercises to test new concepts of mobility.

In addition, the use of operations analysts in planning, observing, recording data, and analyzing results for the field test program appears to me to be essential to the effective accomplishment of the entire re-examination.

As a first step in your re-examination of Army aviation requirements, I would like by 15 May 1962 an outline of how you plan to conduct the re-examination program. The actual re-examination should be completed and your recommendations submitted by 1 September 1962.

/s/ Robert S. McNamara

THE SECRETARY OF DEFENSE

Washington

April 19, 1962

MEMORANDUM FOR MR. STAHR:

I have not been satisfied with Army program submissions for tactical mobility. I do not believe the Army has fully explored the opportunities offered by aeronautical technology for making a revolutionary break with traditional surface mobility means. Air vehicles operating close to, but above, the ground appear to me to offer the possibility of a quantum increase in effectiveness, I think that every possibility in this area should be exploited.

We have found that air transportation is cheaper than rail or ship transportation even in peacetime. The urgency of war time operations makes air transportation even more important. By exploiting aeronautical potential, we should be able to achieve a major increase in effectiveness while spending on airmobility systems no more than we have been spending on systems oriented for ground transportation.

I therefore believe that the Army's re-examination of its aviation requirements should be a bold "new look" at land warfare mobility. It should be conducted in an atmosphere divorced from traditional viewpoints and past policies. The only objective the actual task force should be given is that of acquiring the maximum attainable mobility within alternative funding levels and technology. This necessitates a readiness to substitute airmobility systems for transitional ground systems wherever analysis shows the substitution to improve our capabilities or effectiveness. It also requires that bold, new ideas which the task force may recommend be protected from veto or dilution by conservative staff review.

In order to ensure the success of the re-examination I am requesting in my official memorandum, I urge you to give its implementation your close personal attention. More specifically, I suggest that you establish a managing group of selected individuals to direct the review and keep you advised of its progress. If you choose to appoint such a committee, I suggest the following individuals be considered as appropriate for service thereon: Lt. Gen. Hamilton H. Howze, Brig. Gen. Delk M. Oden, Brig. Gen. Walter B. Richardson, Col. Robert R. Williams, Col. John Norton, Col. A. J. Rankin, Mr. Frank A. Parker, Dr. Edwin W. Paxon and Mr. Edward H. Heinemann.

Existing Army activities such as Fort Rucker, STAG (Strategic and Tactics Analysis Group, Washington, D.C.), CDEC (Combat Development Experimental Center, Ft. Ord), and CORG (Combat Operations Research Group, Ft. Monroe), combined with the troop units and military study headquarters of CONARC, and in cooperation with Air Force troop carrier elements, appear to provide the required capabilities to conduct the analyses, field tests and exercises, provided their efforts are properly directed.

The studies already made by the Army of airmobile divisions and their subordinate airmobile units, of airmobile reconnaissance regiments, and of aerial artillery indicate the type of doctrinal concepts which could be evolved, although there has been no action to carry these concepts into effect. Parallel studies are also needed to provide air vehicles of improved capabilities and to eliminate ground-surface equipment and forces whose duplicate but less effective capabilities can no longer be justified economically. Improved V/STOL air vehicles may also be required as optimized weapons platforms, command and communications vehicles, and as short range prime movers of heavy loads up to 40 or 50 tons.

I shall be disappointed if the Army's re-examination merely produces logistics-oriented recommendations to procure more of the same, rather than a plan for implementing fresh and perhaps unorthodox concepts which will give us a significant increase in mobility.

/s/ Robert S. McNamara

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